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UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/531,633	03/21/2000	Zhe Li		6773

7590   11/14/2003

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EXAMINER
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ART UNIT	PAPER NUMBER
2123	5

DATE MAILED: 11/14/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

	Application No.	**Applicant(s)**
Office Action Summary	09/531,633	LI, ZHE
	Examiner	**Art Unit**
	Eduardo Garcia-Otero	2123

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) FROM
THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed
  after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any
  earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _20 October 2003_.

2a)☒ This action is **FINAL.**   2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is
closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _1-17_ is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) _1-17_ is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All b)☐ Some * c)☐ None of:

      1.☐ Certified copies of the priority documents have been received.

      2.☐ Certified copies of the priority documents have been received in Application No. _____.

      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage
application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

13)☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application)
since a specific reference was included in the first sentence of the specification or in an Application Data Sheet.
37 CFR 1.78.

    a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific
reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1)☐ Notice of References Cited (PTO-892)   4)☐ Interview Summary (PTO-413) Paper No(s). _____ .

2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5)☐ Notice of Informal Patent Application (PTO-152)

3)☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ . 6)☐ Other: .

DETAILED ACTION: Final Action

Introduction

1. Title is: METHOD FOR CONDITIONAL TAUTOLOGY CHECKING

2. First named inventor is: LI.

3. Claims 1-17 have been submitted, examined, and rejected.

4. Priority is claimed to provisional application 60/125,835 filed 3/24/1999.

5. This action is in response to Applicant's Amendment received 10/20/03.

Index of Prior Art

6. **Simpson** refers to US Patent 5,642,304.

7. **Okuzawa** refers to US Patent 5,243,538.

8. **Tucker** refers to The Computer Science and Engineering Handbook, by Allen B. Tucker, CRC Press, ISBN: 0-8493-2909-4, 1996.

Applicant's Remarks

9. CUBE. Remarks page 16. Applicant persuasively asserts that the specification page 6 definition of "cube" is equivalent to the Simpson column 13 line 28, particularly in view of Simpson Table 2. Thus, specification objections, and the 35 USC 112 rejections related to "cube" are withdrawn.

10. RANGE. Remarks page 18-19. Applicant has amended the specification at page 10 to clarify the use of the term "range". To summarize, not every cube may be represented by a range, and also not every range may represent a cube. The 35 USC 112 rejections related to "range" are withdrawn.

11. **Thus, all objections and all 35 USC 112 rejections are withdrawn.**

12. 35 USC 103(a). CLAIMS 1, 4-8, 11-12, AND 17. Remarks page 19-21. The Applicant has numbered his remarks as 1-7, and the Examiner will follow this structure.

13. OKUZAWA. (1) and (2). Applicant distinguishes Okuzawa from the claimed invention in several respects. However, Applicant does not address whether Okuzawa discloses the specific limitations as stated in the 35 USC 103 rejections. In a 35 USC 103 rejection, elements from multiple sources are combined to disclose all of the claim elements.

14. TUCKER. (3). Applicant is correct that Tucker's methods are applicable to parallel processing, and that Tucker does not disclose Boolean functions etc. However, Applicant

does not address whether Tucker discloses the specific limitations as stated in the 35 USC 103 rejections. In a 35 USC 103 rejection, elements from multiple sources are combined to disclose all of the claim elements.

15. MPEP 2144.04(VI)(B), DUPLICATION OF PARTS. (4). Applicant asserts that MPEP 21244.04 does not apply. However, note that the rejection uses Tucker and MPEP 21244.04 as disclosing a claim limitation. Note that Tucker states at page 287 "A divide-and-conquer" algorithm first splits the problem to be solved into subproblems that are easier to solve than the original problem either because they are smaller instances of the original problem, or because they are different but easier problems". Thus, Tucker discloses that dividing the problem into smaller sections (multiple sections) may create "different but easier problems". By this term, Tucker is disclosing the "easier problems after the simplifying step" which the Applicant asserts at Remarks page 21.

16. Further, note that claim 1 does not require any simplification, but merely requires "a plurality of smaller subsets".

17. OBVIOUSNESS. (5). Applicant asserts "It is never obvious how to combine ideas from different fields". First, this assertion is contrary to the MPEP and relevant case law. Second, Applicant does not provide any supporting logical argument why the fields are different, and/or why the combinations are not obvious.

18. SIMPLIFICATION. (6). Okuzawa's "simplification" and Tucker's "divide and conquer... easier problems" must be interpreted in the view of one of ordinary skill in the art, who would be very familiar with Karnaugh map (or Veitch diagram) simplification of truth tables, in order to obtain the minimum number of variables needed to express the Boolean function algebraically (in sum of products form, or else in product of sums form) instead of using a complete set of minterms. Also see Simpson Abstract "close Boolean minimization format".

19. RANGE. (7). Applicant asserts "sometimes it is impossible to represent certain logic circuit, truth table or Boolean expression as a range of binary integers", which is correct. However, Remarks page 19 states "if each range includes only one binary integer, any subset of a Boolean input space may be represented as a union of such ranges".

20. 35 USC 103. CLAIMS 2-3, AND 16. Remarks page 22-23. Again, the Examiner will follow the Applicant's numbering system.

21. SIMPSON'S CUBE. (1). Applicant states "Simpson's cube is used to solve a different problem". It is not clear how Applicant's statement is related to the issue. The issue is whether Simpson discloses the specific limitations as stated in the 35 USC 103 rejection.

22. SIMPSON TEACHES. (2). Applicant asserts that Simpson teaches away from using "conventional" computer, citing column 4 lines 48-54. Applicant is correct that Simpson is (overall) directed toward an improved apparatus (see Abstract). However, Simpson does disclose a number of processes which have general application, including using conventional computers. Additionally, none of the claims have any limitation which require using conventional computers. Again, the issue is whether Simpson discloses the specific limitations as stated in the 35 USC 103 rejection.

23. OBVIOUSNESS. (3). Applicant asserts "It is never obvious how to combine ideas from different fields". First, this assertion is contrary to the MPEP and relevant case law. Second, Applicant does not provide any supporting logical argument why the fields are different, and/or why the combinations are not obvious.

24. 35 USC 103. CLAIMS 9-10, AND 13-15. Remarks page 23-25. Again, the Examiner will follow the Applicant's numbering system.

25. TUCKER. (1). See above discussion.

26. MPEP 2144.04(VI)(A), SCALING. (2). The scaling must be interpreted in view of Tucker's "divide-and-conquer" algorithm, and in view of one of ordinary skill in the arrt which would be very familiar with Karnaugh map (or Veitch diagram) simplification of truth tables, in order to obtain the minimum number of variables needed to express the Boolean function algebraically (in sum of products form, or else in product of sums form) instead of using a complete set of minterms. See Simpson Abstract "close Boolean minimization format". Also see Okuzawa FIG 1 "SIMPLIFICATION".

27. OBVIOUSNESS. (3). Applicant asserts "It is never obvious how to combine ideas from different fields". First, this assertion is contrary to the MPEP and relevant case law. Second, Applicant does not provide any supporting logical argument why the fields are different, and/or why the combinations are not obvious.

28. **In summary, Applicant's assertions regarding 35 USC 103 are not persuasive, and the 35 USC 103 rejections are repeated below with slight modifications to match the amendments.**

Claim Rejections - 35 USC § 103

29. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action: (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

30. The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

31. Determining the scope and contents of the prior art.

32. Ascertaining the differences between the prior art and the claims at issue.

33. Resolving the level of ordinary skill in the pertinent art.

34. Considering objective evidence present in the application indicating obviousness or nonobviousness.

35. **Claims 1-17 are rejected under 35 U.S.C. 103(a) as being unpatentable.**

36. <u>Claim 1 is rejected</u> under 35 U.S.C. 103(a) as being unpatentable over Okuzawa in view of Tucker and MPEP 2144.04(VI)(B) legal precedent for duplication.

37. Claim 1 is an independent claim with 3 limitations.

38. **A-receiving said Boolean function, said Boolean constant and said given subset of the input space** is disclosed by Okuzawa FIG 1 "BOOLEAN EXPRESSION" and "TRUTH TABLE".

39. B(part two)-[dividing said given subset of the input space into a set of a plurality of smaller subsets of the input space,] **whereby the conclusion is positive if said Boolean function is equivalent to said Boolean constant within every member of said set of a plurality of smaller subsets of the input space** is disclosed by Okuzawa at FIG 1 "COMPARISON".

40. Okuzawa does not expressly disclose the remaining limitation.

41. B(part one)-**dividing said given subset of the input space into a set of a plurality of smaller subsets of the input space** is disclosed by Tucker at page 287 "A divide-and-

conquer" algorithm first splits the problem to be solved into subproblems that are easier to solve than the original problem either because they are smaller instances of the original problem, or because they are different but easier problems", and Tucker page 2034 "Parallel Functional Programming... determining the appropriate granularity", and MPEP 2144.04(VI)(B) *In re Harza* (legal precedent for duplication), 274 F.2d 669, 124 USPQ 378, 380 (CCPA 1960) which states "It is well settled that the mere duplication of parts has no patentable significance unless a new and unexpected result is produced". See MPEP 2144.04(VI)(B). In this claim, duplicating the part does not produce any new result and does not produce any unexpected result. Note dividing the single given subset of input space into multiple smaller subsets (duplicating the part) does not produce any new and unexpected result. Also see MPEP 2144.04(IV)(A) regarding changes in size and proportion.

42. **At the time** the invention was made, it would have been obvious to a person of ordinary skill in the art to use Tucker and MPEP 2144.04(VI)(B) to modify Okuzawa. One of ordinary skill in the art would have been motivated to do this to simplify the equivalence comparison by comparing a single logical expression at a time (Tucker) or a single input point at a time (MPEP 2144.04(VI)(B)), and thus to reduce the resources required (such as RAM) to perform the equivalence comparison, and/or to speed calculations by allowing parallel processing of smaller subsets.

43. Claim 2 (currently amended) is rejected under 35 U.S.C. 103(a) as being unpatentable over Okuzawa in view of Tucker and MPEP 2144.04(VI)(B) legal precedent for duplication and Simpson.

44. Claim 2 (currently amended) depends from claim 1, with two additional limitations.

45. **B-simplifying, if said given subset of the input space is a cube, said Boolean function with substituting the input variables in said Boolean function with Boolean constants according to the substitution requirements provided by said cube, whereby the conclusion is positive if the simplification result is said Boolean constant, and the conclusion is negative if the simplification result is a Boolean constant other than said Boolean constant** is disclosed by Okuzawa FIG 1 "SIMPLIFICATION" and "COMPARISON".

46. Okuzawa does not expressly disclose the remaining limitation.

47. A-**determining whether said given subset of the input space is a cube** is disclosed by
    Simpson Column 13 line 28 "cube".

48. <u>Claim 3 is rejected</u> under 35 U.S.C. 103(a) as being unpatentable over Okuzawa in view of
    Tucker and MPEP 2144.04(VI)(B) legal precedent for duplication and Simpson.

49. Claim 3 depends from claim 2, with one additional limitation.

50. **replacing said Boolean function with the simplification result of the simplifying step
    before the dividing step, whereby the simplification result is used as said Boolean
    function in all later steps** is disclosed by Okuzawa FIG 1 "SIMPLIFICATION" and
    "COMPARISON".

51. <u>Claim 4 (currently amended) is rejected</u> under 35 U.S.C. 103(a) as being unpatentable over
    Okuzawa in view of Tucker and MPEP 2144.04(VI)(B) legal precedent for duplication.

52. Claim 4 (currently amended) depends from claim 1, with one additional limitation.

53. **a member of said set of a plurality of smaller subsets of the input space is a cube within
    said given subset of the input space, whereby it is possible to substitute the input
    variables in said Boolean function with Boolean constants according to the substitution
    requirements provided by of said cube** is disclosed by Okuzawa FIG 1
    "SIMPLIFICATION" and "COMPARISON".

54. <u>Claim 5 (currently amended) is rejected</u> under 35 U.S.C. 103(a) as being unpatentable over
    Okuzawa in view of Tucker and MPEP 2144.04(VI)(B) legal precedent for duplication.

55. Claim 5 (currently amended) depends from claim 4, with one additional limitation.

56. **simplifying said Boolean function with substituting the input variables in said Boolean
    function with Boolean constants according to the substitution requirements provided by
    said cube, whereby the conclusion is positive if the simplification result is said Boolean
    constant, and the conclusion is negative if the simplification result is the Boolean
    constant other than said Boolean constant** is disclosed by Okuzawa FIG 1
    "SIMPLIFICATION" and "COMPARISON".

57. <u>Claim 6 is rejected</u> under 35 U.S.C. 103(a) as being unpatentable over Okuzawa in view of
    Tucker and MPEP 2144.04(VI)(B) legal precedent for duplication.

58. Claim 6 depends from claim 5, with one additional limitation.

59. **repeating the dividing step and the simplifying step if the simplification result is not a Boolean constant, whereby said cube is smaller and the simplification result will eventually be a Boolean constant when said cube is small enough** is disclosed by Okuzawa FIG 1 "SIMPLIFICATION" and "COMPARISON".

60. <u>Claim 7 is rejected</u> under 35 U.S.C. 103(a) as being unpatentable over Okuzawa in view of Tucker and MPEP 2144.04(VI)(B) legal precedent for duplication.

61. Claim 7 depends from claim 4, with one additional limitation.

62. **said given subset of the input space is represented as a first range of binary integers** is disclosed by Okuzawa FIG 1 "LOGIC CIRCUIT TRUTH TABLE BOOLEAN EXPRESSION".

63. <u>Claim 8 is rejected</u> under 35 U.S.C. 103(a) as being unpatentable over Okuzawa in view of Tucker and MPEP 2144.04(VI)(B) legal precedent for duplication.

64. Claim 8 depends from claim 7, with one additional limitation.

65. Okuzawa does not expressly disclose the remaining limitation.

66. **said set of a plurality of smaller subsets of the input space has only two members; said cube which is represented as a second range of binary integers, and a second member which is represented as a third range of binary integers, whereby said third range of binary integers is divided repeatedly into cubes and such divisions do not need to all complete if the negative conclusion is given for any of these cubes** is disclosed by is disclosed by Tucker at page 287 "A divide-and-conquer" algorithm first splits the problem to be solved into subproblems that are easier to solve than the original problem either because they are smaller instances of the original problem, or because they are different but easier problems", and Tucker page 2034 "Parallel Functional Programming... determining the appropriate granularity", and MPEP 2144.04(VI)(B) *In re Harza* (legal precedent for duplication), 274 F.2d 669, 124 USPQ 378, 380 (CCPA 1960) which states "It is well settled that the mere duplication of parts has no patentable significance unless a new and unexpected result is produced". See MPEP 2144.04(VI)(B). In this claim, duplicating the part does not produce any new result and does not produce any unexpected result. Note dividing the single given subset of input space into multiple smaller subsets (duplicating the part) does not produce any new and unexpected result.

67. <u>Claim 9 (currently amended) is rejected</u> under 35 U.S.C. 103(a) as being unpatentable over Okuzawa in view of Tucker and MPEP 2144.04(VI)(B) legal precedent for duplication and further in view of MPEP 2144.04(IV)(A) legal precedent for changing size/proportion.

68. Claim 9 (currently amended) depends from claim 8, with one additional limitation.

69. Okuzawa does not expressly disclose the remaining limitation.

70. **replacing said given subset of the input space, represented as said first range of binary integers, with said second member of said set of a plurality of smaller subsets of the input space, represented as said third range of binary integers, after finishing all steps related to said cube and said second range of binary integers which represents said cube, whereby said given subset of the input space become smaller and smaller and whether said Boolean function is equivalent to said Boolean constant within said given subset of the input space can be determined using simplification when said subset of the input space eventually becomes a cube** is disclosed by Tucker at page 287 "A divide-and-conquer" algorithm first splits the problem to be solved into subproblems that are easier to solve than the original problem either because they are smaller instances of the original problem, or because they are different but easier problems", and Tucker page 2034 "Parallel Functional Programming... determining the appropriate granularity", and is disclosed by 2144.04(IV)(A) legal precedent for changing size/proportion. *In re Rinehart*, 531 F.2d 1048, 1953, 189 USPQ 143, 148 (CCPA 1976) states "mere scaling up of a prior art process capable of being scaled up, if such were the case, would not establish patentability in a claim to an old process so scaled". Similarly, merely shifting the regions of the input space being considered would not establish patentability.

71. <u>Claim 10 is rejected</u> under 35 U.S.C. 103(a) as being unpatentable over Okuzawa in view of Tucker and MPEP 2144.04(VI)(B) legal precedent for duplication and further in view of MPEP 2144.04(IV)(A) legal precedent for changing size/proportion.

72. Claim 10 depends from claim 9, with one additional limitation.

73. Okuzawa does not expressly disclose the remaining limitation.

74. **shifting a boundary of said third range of binary integers before the replacing step if the corresponding boundary of said first range of binary integers is shifted, whereby a boundary of said first range of binary integers can shift dynamically** is disclosed by

Tucker at page 287 "A divide-and-conquer" algorithm first splits the problem to be solved

into subproblems that are easier to solve than the original problem either because they are

smaller instances of the original problem, or because they are different but easier problems",

and Tucker page 2034 "Parallel Functional Programming... determining the appropriate

granularity", and is disclosed by 2144.04(IV)(A) legal precedent for changing

size/proportion. *In re Rinehart*, 531 F.2d 1048, 1953, 189 USPQ 143, 148 (CCPA 1976)

states "mere scaling up of a prior art process capable of being scaled up, if such were the

case, would not establish patentability in a claim to an old process so scaled". Similarly,

merely shifting a boundary of the input space being considered would not establish

patentability.

75. <u>Claim 11 (currently amended) is rejected</u> under 35 U.S.C. 103(a) as being unpatentable over

Okuzawa in view of Tucker and MPEP 2144.04(VI)(B) legal precedent for duplication.

76. Claim 11 (currently amended) depends from claim 4, with one additional limitation.

77. **substituting the input variables in said Boolean function with Boolean constants**

according to the substitution requirements provided by said cube, whereby any

tautology checking method can be used to process the Boolean function resulted from

the substitution is disclosed by Okuzawa FIG 1 "SIMPLIFICATION" and

"COMPARISON".

78. <u>Claim 12 is rejected</u> under 35 U.S.C. 103(a) as being unpatentable over Okuzawa in view of

Tucker and MPEP 2144.04(VI)(B) legal precedent for duplication.

79. Claim 12 depends from claim 11, with one additional limitation.

80. **said given subset of the input space is represented as a first range of binary integers** is

disclosed by Okuzawa FIG 1 "LOGIC CIRCUIT TRUTH TABLE BOOLEAN

EXPRESSION".

81. <u>Claim 13 is rejected</u> under 35 U.S.C. 103(a) as being unpatentable over Okuzawa in view of

Tucker and MPEP 2144.04(VI)(B) legal precedent for duplication and further in view of

MPEP 2144.04(IV)(A) legal precedent for changing size/proportion.

82. Claim 13 depends from claim 12, with one additional limitation.

83. Okuzawa does not expressly disclose the remaining limitation.

84. **said set of a plurality of smaller subsets of the input space has only two members: said cube which is represented as a second range of binary integers, and a second member which is represented as a third range of binary integers, whereby said third range of binary integers is divided repeatedly into cubes and such divisions do not need to all complete if the negative conclusion is given for any of these cubes** is disclosed by Tucker at page 287 "A divide-and-conquer" algorithm first splits the problem to be solved into subproblems that are easier to solve than the original problem either because they are smaller instances of the original problem, or because they are different but easier problems", and Tucker page 2034 "Parallel Functional Programming… determining the appropriate granularity", and is disclosed by 2144.04(IV)(A) legal precedent for changing size/proportion. *In re Rinehart*, 531 F.2d 1048, 1953, 189 USPQ 143, 148 (CCPA 1976) states "mere scaling up of a prior art process capable of being scaled up, if such were the case, would not establish patentability in a claim to an old process so scaled". Similarly, merely changing the size of the input space being considered would not establish patentability.

85. <u>Claim 14 (currently amended) is rejected</u> under 35 U.S.C. 103(a) as being unpatentable over Okuzawa in view of Tucker and MPEP 2144.04(VI)(B) legal precedent for duplication and further in view of MPEP 2144.04(IV)(A) legal precedent for changing size/proportion.

86. Claim 14 (currently amended) depends from claim 13, with one additional limitation.

87. Okuzawa does not expressly disclose the remaining limitation.

88. **replacing said given subset of the input space, represented as said first range of binary integers, with said second member of said set of a plurality of smaller subsets of the input space, represented as said third range of binary integers, after finishing all steps related to said cube and said second range of binary integers which represent said cube, whereby said given subset of the input space become smaller and smaller and whether said Boolean function is equivalent to said Boolean constant within said given subset of the input space can be determined using simplification when said given subset of the input space eventually becomes a cube** is disclosed by Tucker at page 287 "A divide-and-conquer" algorithm first splits the problem to be solved into subproblems that are easier to solve than the original problem either because they are smaller instances of the original

problem, or because they are different but easier problems", and Tucker page 2034 "Parallel Functional Programming... determining the appropriate granularity", and is disclosed by 2144.04(IV)(A) legal precedent for changing size/proportion. *In re Rinehart*, 531 F.2d 1048, 1953, 189 USPQ 143, 148 (CCPA 1976) states "mere scaling up of a prior art process capable of being scaled up, if such were the case, would not establish patentability in a claim to an old process so scaled". Similarly, merely shifting the boundaries of the input space being considered would not establish patentability.

89. <u>Claim 15 is rejected</u> under 35 U.S.C. 103(a) as being unpatentable over Okuzawa in view of Tucker and MPEP 2144.04(VI)(B) legal precedent for duplication and further in view of MPEP 2144.04(IV)(A) legal precedent for changing size/proportion.

90. Claim 15 depends from claim 14, with one additional limitation.

91. Okuzawa does not expressly disclose the remaining limitation.

92. **shifting a boundary of said third range of binary integers before the replacing step if the corresponding boundary of said first range of binary integers is shifted, whereby a boundary of said first range of binary integers can shift dynamically** is disclosed by Tucker at page 287 "A divide-and-conquer" algorithm first splits the problem to be solved into subproblems that are easier to solve than the original problem either because they are smaller instances of the original problem, or because they are different but easier problems", and Tucker page 2034 "Parallel Functional Programming... determining the appropriate granularity", and is disclosed by 2144.04(IV)(A) legal precedent for changing size/proportion. *In re Rinehart*, 531 F.2d 1048, 1953, 189 USPQ 143, 148 (CCPA 1976) states "mere scaling up of a prior art process capable of being scaled up, if such were the case, would not establish patentability in a claim to an old process so scaled". Similarly, merely shifting the boundaries of the input space being considered would not establish patentability.

93. <u>Claim 16 (currently amended) is rejected</u> under 35 U.S.C. 103(a) as being unpatentable over Okuzawa in view of Tucker and MPEP 2144.04(VI)(B) legal precedent for duplication, and Simpson.

94. Claim 16 (currently amended) depends from claim 1, with two additional limitations.

95. **B-substituting, if said given subset of the input space is a cube, the input variables in said Boolean function with Boolean constants according to the substitution requirements provided by said cube, whereby any tautology checking can be used to process the Boolean function resulted from the substitution** is disclosed by Okuzawa FIG 1 "SIMPLIFICATION" and "COMPARISON".

96. Okuzawa does not expressly disclose the remaining limitation.

97. **A-determining whether said given subset of the input space is a cube** is disclosed by Simpson Column 13 line 28 "cube".

98. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Okuzawa in view of Tucker and MPEP 2144.04(VI)(B) legal precedent for duplication.

99. Claim 17 depends from claim 1, with one additional limitation.

100.   Okuzawa does not expressly disclose the remaining limitation.

101.   **starting a process for each member of said set of a plurality of smaller subsets of the input space determining whether said Boolean function is equivalent to said Boolean constant within said member of said set of a plurality of smaller subsets of the input space, whereby these processes can run on the same computer or on several computers, at the same time or at different times** is disclosed by Tucker at page 287 "A divide-and-conquer" algorithm first splits the problem to be solved into subproblems that are easier to solve than the original problem either because they are smaller instances of the original problem, or because they are different but easier problems", and Tucker page 2034 "Parallel Functional Programming... determining the appropriate granularity", and is disclosed by MPEP 2144.04(VI)(B) *In re Harza* (legal precedent for duplication), 274 F.2d 669, 124 USPQ 378, 380 (CCPA 1960) which states "It is well settled that the mere duplication of parts has no patentable significance unless a new and unexpected result is produced". In this claim, duplicating the part does not produce any new result and does not produce any unexpected result. Note dividing the single given subset of input space into multiple smaller subsets (duplicating the part) does not produce any new and unexpected result. Also see MPEP 2144.04(IV)(A) regarding changes in size and proportion.

MOTIVATION FOR CLAIMS 2-17

102.   **At the time** the invention was made, one of ordinary skill would have begun with
Okuzawa FIG 1 for verification by simplification and comparison. One of ordinary skill
would then turn to Simpson for the basic Boolean "cube" system in order to clearly define
the possible input space for purposes of subdividing the problem. One of ordinary skill
would then turn to Tucker or to legal precedents from MPEP 2144.04(VI)(B) and MPEP
2144.04(IV)(A) to divide the input space into multiple regions and/or into smaller regions.
One of ordinary skill in the art would have been motivated to do this to simplify the
equivalence comparison by comparing a small regions at a time, and/or to reduce the
resources required (such as RAM) to perform the equivalence comparison, and/or to speed
calculations by allowing parallel processing of smaller subsets.

Additional Cited Prior Art

103.   The following US patents or publications are hereby cited as prior art, but have not been
used for rejection. Applicant should review these carefully before responding to this office
action.

104.   Jain US Patent 6,389,374 discloses "sampling subspaces of a Boolean space" at Abstract.

105.   Li US Patent 6,339,837 discloses "function verification... equivalent to a predetermined
constant" at Abstract.

106.   "Logic Verification using Binary Decision Diagrams in a Logic Synthesis Environment"
by Sharad Malik et al., 1988 IEEE, pages 6-9, discloses "formal logic verification" at
Abstract.

107.   "Boolean Functions Classification via Fixed Polarity Reed-Muller Forms" by Chien-
Chung Tsai et al., 1997 IEEE TRANSACTIONS ON COMPUTERS, Vol 46, No. 2, pages
173-186 discloses "functional equivalence" at Abstract.

Conclusion

108.   All objections and 35 USC 112 rejections are withdrawn.

109.   All pending claims are rejected under 35 USC 103.

110.   On a minor procedural matter, Applicant's amendment fax was barely legible.
Specifically, many of the pages appeared to vertically compressed by about 40%. The
Examiner requests, but does not require, that Applicant use regular mailing instead of faxing.

There may be some compatibility problem between the Applicant's fax machine and the PTO fax machine.
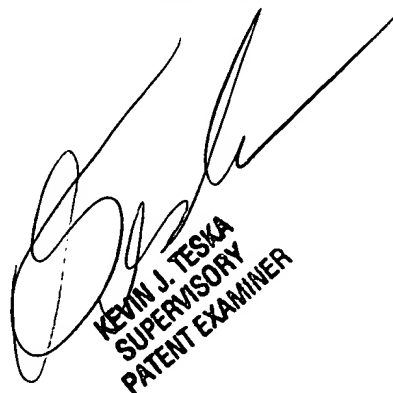
Response to Amendments or new IDS-FINAL OFFICE ACTION

111.   Applicant's amendments or new IDS necessitated the new ground(s) of rejection presented in this Office action. Accordingly, THIS ACTION IS MADE FINAL. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a). A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Communication

112.   Any inquiry concerning this communication or earlier communications from the examiner should be directed to Eduardo Garcia-Otero whose telephone number is 703-305-0857. The examiner can normally be reached on Monday through Thursday from 9:00 AM to 7:00 PM. If attempts to reach the Examiner by telephone are unsuccessful, the Examiner's supervisor, Kevin Teska, can be reached at (703) 305-9704. The fax phone number for this group is 703-872-9306. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the group receptionist, whose telephone number is (703) 305-3900.

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